

CLASSIFICATION

*Unclassified 8 Jan 54 UN/EDP*CENTRAL INTELLIGENCE AGENCY ~~CONFIDENTIAL~~ REPORT

INFORMATION FROM

FOREIGN DOCUMENTS OR RADIO BROADCASTS CD NO.

STAT

COUNTRY USSR

DATE OF  
INFORMATION 1948

SUBJECT Scientific - Dielectrics

DATE DIST<sup>3</sup> Apr 1950HOW  
PUBLISHED Monthly periodical

NO. OF PAGES 3

WHERE  
PUBLISHED MoscowDATE  
PUBLISHED Nov 1949SUPPLEMENT TO  
REPORT NO.

LANGUAGE Russian

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE  
OF THE UNITED STATES WITHIN THE MEANING OF ESPIONAGE ACT NO  
U. S. C., 51 AND 52, AS AMENDED. ITS TRANSMISSION OR THE REVELATION  
OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PRO-  
HIBITED BY LAW. REPRODUCTION OF THIS FORM IS PROHIBITED.

THIS IS UNEVALUATED INFORMATION

SOURCE Elektrichestvo, No 11, 1949.REVIEW OF "HIGH-FREQUENCY INORGANIC DIELECTRICS"

Kh. S. Valeyev  
State Research Electroceramic Institute

(High-Frequency Inorganic Dielectrics, by Professor N. P. Bogoroditskiy, Doctor of Technical Sciences and Stalin Prize Laureate, and I. D. Fridberg, Candidate of Technical Sciences, published by "Soviet Radio" 1948, 338 pages, 21 rubles)

This volume is of great value as it systematizes a large amount of material on high-frequency dielectrics. The authors have played a prominent part in producing and investigating the inorganic -- mainly ceramic -- insulating materials required by industry.

Modern ceramics intended for high-frequency installations have become so differentiated in their electrophysical and physicochemical features that it has become impossible to use them properly without a special study of their properties. Since the book is written by highly qualified specialists who have created many ceramic materials under the present-day policy of wide-scale development and introduction of high-frequency ceramic materials into industry, it is of great interest to plant workers who produce and use ceramic materials, as well as to students and technicians studying insulating technology.

The main body of the book is an original monograph on the fundamentals of dielectric physics and technology, and consists of data obtained by the authors while studying a number of important high-frequency insulation problems.

The book is divided into four parts. The first part, consisting of 12 chapters, is devoted to the main physical properties of dielectrics and covers dielectric constants, conductivity, dielectric losses, heat and electrical breakdown of dielectrics, air breakdown and discharge over the surface of dielectrics, volume and surface hygroscopy, and the mechanical strength of commercial dielectrics.

- 1 -

CLASSIFICATION

~~CONFIDENTIAL~~

STATE	<input checked="" type="checkbox"/> NAVY	<input checked="" type="checkbox"/> NSRB	DISTRIBUTION									
ARMY	<input checked="" type="checkbox"/> AIR	<input checked="" type="checkbox"/> FBI										

STAT

The second part is devoted to the electrical properties and structure of dielectrics and consists of an introduction and two chapters. Dielectric losses and the structure of polycrystalline dielectrics and inorganic glasses are examined.

The third part is devoted to the properties and technology of inorganic dielectrics. This part, which comprises six chapters, is more than one third of the total volume of the book. It examines ceramic dielectrics, methods of manufacturing ceramic parts, methods of attaching metallic reinforcement to ceramic parts, inorganic glasses, mica, materials of secondary importance, and monocrystalline dielectrics.

The fourth part is devoted to the use of ceramics in high-frequency apparatus. Installation parts, inductance coils, high-frequency condensers, and wire-less resistances are examined.

The appendix lists the principle tests for high-frequency dielectrics and contains a small bibliography.

The authors thus cover all the main problems connected with the physics and technology of the process of producing ceramic materials and parts. Consequently, many important problems in the physics and technology of other inorganic dielectrics receive a very sketchy treatment. Moreover, the book contains some inaccurate statements.

In the chapter devoted to dielectric constants, in addition to the equations of Clausius-Mosotti and Born which are listed, a detailed account should have been given of the more accurate equations of G. I. Skanavi, which have been extensively treated in USSR and foreign periodicals.

Chapters IV, V and VI, devoted to the breakdown of dielectrics could have been combined into one, putting the emphasis on the breakdown of inorganic dielectrics. The graphical method of calculating thermal breakdown and the examination of surface discharge along insulators under various conditions of moisture and frequency of the applied field is of great practical interest. The chapters devoted to volume and surface hygroscopy are also of very great interest. However, more detailed account of the procedure for determining the moisture stability of ceramic materials would have been desirable.

In the chapter on dielectric constants it would have been well to supply a key to the symbols given to the coefficients of dielectric polarization. As it is, confusion may arise when this section is read.

It should have been pointed out that the formula for calculating TK  $\epsilon$  of mixtures can be used only when there is no chemical reaction between the components. Mention should also have been made of the fact that in approximate calculations of  $\epsilon$  and TK  $\epsilon$  for ceramic materials, it is necessary to allow for the glass phase and the closed air pores which are always to be found in ceramic materials, as well as for the crystalline phases of the individual components.

The electrical properties and structure of dielectrics are examined in the second part of the book. It is impossible in a small space (15 pages in all) to cover all the problems concerning the electrical properties of dielectrics in relationship to their structure. The authors have, therefore, described only particular electrical properties ( $\tan \delta$  and  $\rho$ ) and the structure of some crystals and glasses. The role of crystalline phases, vitreous layers and impurities, etc., is also examined in general terms. However, even in a brief exposition, the types of bonds in solids (ionic, homeopolar, metallic and van der Waal) should have been treated on the basis of concrete examples. In examining the energy of a crystal lattice, the formulas of A. Ye. Fersman and A. F. Kapustinsky should have been included as well as Born's.

STAT

The third part gives a detailed account of the classification of ceramic materials according to purpose, the classification of materials according to type of raw material, their fields of application, properties, and prospects of using other materials.

In the chapter on methods of manufacturing ceramic parts, the sections dealing with their classification by technological features, the methods of manufacturing the parts in relation to their purpose, and especially the guide to the design of ceramic parts, Table 13, are of great interest.

The chapter which explains methods of attaching metal reinforcements to ceramic parts is also very valuable. It discusses the mechanical method of attachment, securing the metal to the ceramic by means of cement, vacuum-tight joining of ceramic and metal by brazing, and joining ceramic to metal with glass. Here, use is made of the authors' wealth of experience in the production of various high-quality radio parts.

The paramount defect in the third part of the book is the paucity of information on steatite materials. References to insulating porcelain and certain other materials which are not high-frequency dielectrics could have been omitted.

The profusion of illustrative material (Figures 86-92, 93, 103-109, 113-122, 135-136, etc.) which is not connected with the properties or manufacture of the parts clutters up the book.

The authors' assertion that the casting method is applicable only to the manufacture of large parts when high dimensional accuracy is not required, appears to be made without sufficient foundation. The use of special casting methods enables small ceramic parts to be manufactured with a high degree of dimensional accuracy without additional mechanical treatment.

The authors pay insufficient attention to the kilning of ceramic materials and the types of furnace used for this purpose.

The fourth part of the book, which is devoted to the use of ceramics in high-frequency apparatus, gives a detailed account of various installation parts, condensers, induction coils, and wireless resistors together with the necessary tables and sketches. Based on the parameters of the ceramics used, the condenser calculations by one of the authors are of considerable interest. The chapter on wireless resistors is too brief (less than 3 pages) and in such a form that it hardly satisfies the requirements of a handbook. It would have been very useful to include a section explaining the form and methods of preparing specimens of ceramic materials for determining their electrophysical and physicomachanical properties. The parameters of ceramic materials change considerably, depending on the shape, size, and preparation of the specimen, as a result of which incompatible results are frequently obtained for the same material.

The book contains printing errors, in addition to those listed, which should be corrected in the next edition.

- E N D -